JOURNAL

SEPTEMBER, 1933

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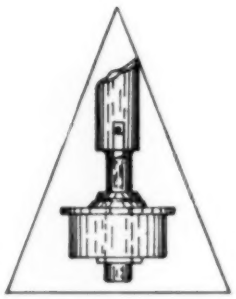

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A. S. T. E. Journal

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Published for Members Only

VOL. II SEPTEMBER, 1933 No. 5

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Ford R. Lamb ..... Meetings
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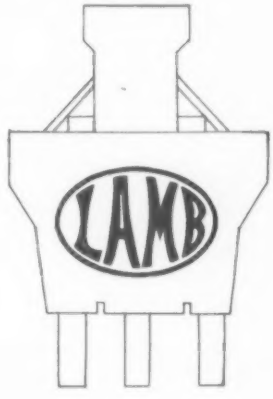
Designers and Builders
of High Grade

MULTIPLE DRILL HEADS
SPECIAL MACHINERY
JIGS AND FIXTURES
PUNCHES AND DIES
TOOLS AND GAGES
INDEX TABLES

QUALITY



DEPENDABILITY

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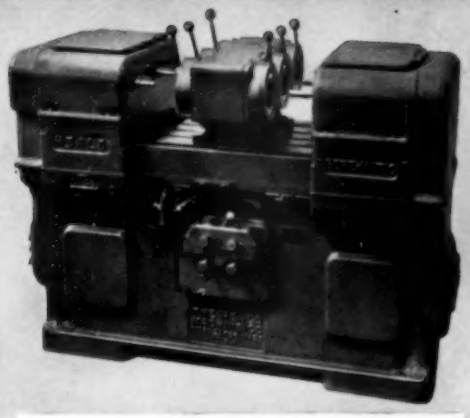
. . . a Heald Bore-Matic
for every Manufacturing Requirement



Heald No. 46 Double-end Multi-spindle Bore-Matic. This machine is ideal where there is mass production or a number of pieces to be borized at the same setting.

TO take care of the ever increasing demand for more and more borizing, both by the large manufacturer with mass production as well as the average and smaller shops, we have designed and built a complete line of Bore-Matics.

These machines make possible both a direct and indirect saving by producing, consistently, work to such a close degree of accuracy in regard to size, roundness, straightness and location of finished holes and surfaces, that scrap is eliminated, individual inspection is unnecessary and the assembled unit reaches its highest efficiency.

Heald No. 47 Single-end Multi-spindle Bore-Matic. Particularly suited for the manufacturer who has a production of a single piece or a number of parts of normal production.

Literature on any one or all of these Bore-Matics will be gladly sent on request.

Heald No. 48 Small, Simple, Compact Bore-Matic. Meets the demand for an economical machine where there are small or medium size lots or to keep set up on an individual job.

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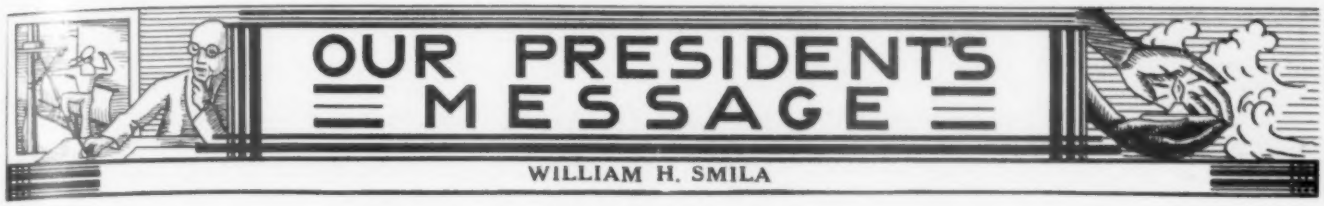


WILLIAM H. SMILA

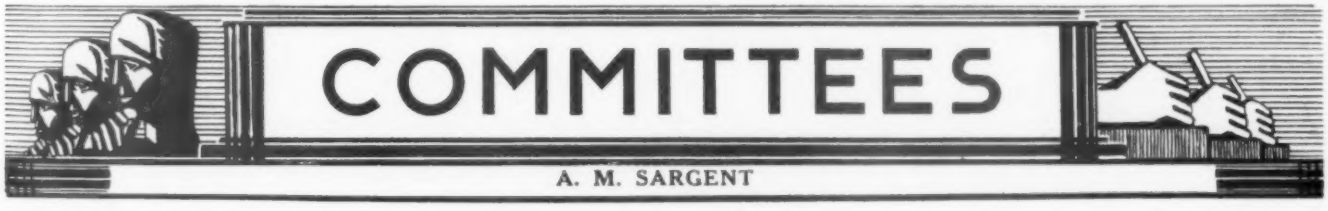
STANDARDIZATION

About six months after the chartering of the A.S.T.E. it was decided that the establishment of a Standardization Committee in the Society would be of great help to many members. Acting upon this thought, the Executive Committee of the Society met and established a method of procedure, and made a check-up of the membership to select a general chairman for this Committee, and the sectional chairmen to work with him. At this meeting it was decided to subdivide this standardization, placing a sectional or division chairman in charge of each section. The subdivisions are as follows:

(a) Jigs and Fixtures for machining
(b) Jigs and Fixtures for assembling
(c) Drawing Room practice
(d) Operation and Methods
(e) Milling Cutters
(f) Drills, Countersinks and Counterbores
(g) Gauges and Gauging methods
(h) Machinery
(i) Grinding
(j) Small Dies
(k) Large Dies
(l) Forging Dies
(m) Turning and Boring Tools and Holders

Mr. E. C. Lee, Chief Tool Designer at the Jefferson Plant of the Chrysler Corporation, was selected as the General Chairman and he, in turn, assisted the Executive Committee in selecting the division chairmen. Several meetings of all these chairmen were held in order to acquaint the various chairmen as to the method of procedure and to select the personnel of his division. About this time the new officers for 1933 were elected, and the Standardization Committee as a whole was to have been re-appointed to serve during the year. But as Mr. Lee felt that his chairmanship was consuming more time than he could spare, he asked to be relieved of his duties. At the installation of the new officers, Mr. Frank Hartlep, Chief Tool Designer at the Timken Detroit Axle Company (our present First Vice-President), was selected to succeed Mr. Lee. Mr. Hartlep has held several meetings with the division chairmen and made some changes which will undoubtedly prove beneficial to the Committee and to the Society. The Standardization Committee do not expect to set up any new standards at the present time, but expect to assemble and distribute to the membership information as to existing standards. This information will be published on standard size sheets suitable for filing in three ring binders and will cover data that is not readily obtainable from standard handbooks. Some real progress will undoubtedly be made by this Committee within the coming fall and winter seasons if all members of this Committee will give their full co-operation.

If any of our members not already serving on this committee wish to take an active part in this work, kindly notify any officers of the Society, and proper assignment will be made. This Committe offers the junior membership an excellent opportunity to obtain some very valuable experience, and we hope it will not be overlooked.



A. M. SARGENT

Our faithful member, Mr. Fred L. Hoffman, due to other duties, has found it necessary to tender his resignation as Chairman of the Membership Committee, which was accepted with regrets, by the Board of Directors at the last official meeting on August 17th.

Mr. Wm. J. Fors, who has been one of our most active members, has been appointed to assume this office for the remainder of the current year, ending April 1934.

The Standard Committe, under Mr. Frank Hartlep, has not been active during the last thirty days, due to heat and the fact that many of the Committee Chairmen were out of the city on vacations. Plans outlined by Mr. Hartlep indicate that considerable activity will be shown in this line immediately following the first of September.

Mr. J. A. Siegel and his Meetings Committe have lived up to the promise made in this section of the Journal last month. They have prepared a meeting for September which we believe will be one of the best we have ever had. The program combines several companies and some very capable speakers covering a subject which will be of interest to every member. In addition, they have been successful in organizing a dinner to be held at the Detroit-Leland Hotel as a part of this meeting and at the old schedule of prices. They are hoping to have a very large attendance.

Due to the fact that many of the members of the Pulications Committee have been more busy than usual taking care of their own work, it has been necessary to employ assistance in the solicitation of advertising and editing this Journal. This Committee has been fortunate in obtaining the services of Mr. J. J. Brown who has had many years of experience in this line of work. We believe you should expect, and will receive, a bigger and better Journal every month from now on.

Any of the boys who are at present unemployed should put in their applications in the Secretary's Office, as we are having more calls for men than can be filled ,especially sheet metal, die men, and body fixture men.

LAST MEETING

THE regular August meeting was held August 11th at the Detroit Socialer Turnverein, East Jefferson Avenue, Detroit, Michigan.

Mr. Wilfred Jones, of the Chrysler Corporation, gave a talk on "Compulsory National Health Insurance," pointing out a practical method of supporting such a measure financially and citing the possible benefits humanity would derive from it.

Mr. Culver, General Manager of the Employer's Association of Detroit, gave a very interesting talk on the NRA (National Recovery Administration), describing some of the complications which have come up to make adoption of the code difficult. He also mentioned the vast amount of detail in connection with the enforcement of the various codes. The various divisions assigned to thresh out some of the special problems that have arisen out of multiplicity of industrial establishments in this country are working eighteen hours a day, Mr. Culver said.

Although Mr. Culver stated that he was behind the NRA and willing to cooperate to the fullest measure possible, he was plainly skeptical as to the future success of the plan. His reasons for doubt as to the feasibility of the "revolutionary," as he termed it, experiment that has been inaugurated by the new administration at Washington, are the usual familiar arguments advanced by conservatives since the beginning of history against new departures in the fields of government and economics. It was Gladstone, we believe, who said that in every great issue in the history of his country (England) between the forces of conservatism and liberalism, future developments invariably showed the conservatives to be in the wrong and the "radicals" in the right. So, while we greatly appreciated Mr. Culver's thoughtful and stimulating talk, we cannot share his pessimistic opinions as to the present economic experiment being carried out in the United States.

NEXT MEETING

"BACK TO BUSINESS" DINNER AND MEETING
THURSDAY, SEPTEMBER 14th, 1933
DETROIT LELAND HOTEL — MAIN BALLROOM
DINNER AT 6:30 P. M. — MEETING FOLLOWING DIRECTLY

Procure tickets from Officers, Members of Committee, or at Ballroom Door.
Price of Dinner will be $1.00.

SPEAKERS:

MR. T. JOHNSON, SPECIALTY SALES ENGINEER OF WHITEHEAD & KALES CO., will speak on the "ADVANTAGES OF ROLLED STEEL FOR MACHINES BASES, DIE SHOES, JIGS AND FIXTURES."

Showing of picture slides will accompany his talk.

MR. J. W. KEYES, ENGINEER OF WELDIT ACETYLENE CO., will speak on "STEEL SHAPE CUTTING."

Directly after the meeting a practical demonstration will be given at the Weldit Acetylene Co., Headquarters on Bagley Ave., just two blocks west of the Hotel.

This demonstration of one of their latest gas cutting machines in operation will be very interesting and with accommodations suitable for a large audience. The Committee asks that all present at the meeting adjourn and follow the crowd.

MR. A. M. CANDY, SPECIAL WELDING ENGINEER OF WESTINGHOUSE ELECTRIC & MFG. CO., will speak on "THE ELECTRIC WELDING OF MACHINE BASES, DIE SHOES, JIGS AND FIXTURES." His talk will also be accompanied by picture slides.

This being the first meeting of a very interesting fall and winter program, the Committee expects a large attendance for both the dinner and meeting, and they request all members and guests who possibly can to make their reservations for the dinner as early as possible, either by purchasing tickets or by notifying the Secretary's office (Phone Madison 2057), thus enabling the Committee to negotiate properly with the Hotel.

JUNIOR NIGHT

Thursday, September 28th, 1933, Eight P. M.
Detroit College of Applied Science
8203 Woodward Avenue

Speaker: Mr. Harry Trevelyan.
Subject: Gages, Their Design and History.

PROBLEM STUDY

Wednesday, September 20th, Eight P. M.
Detroit College of Applied Science
8203 Woodward Avenue

Members are urged to help make these meetings a success by bringing in mathematical problems taht arise in their daily work.

TECHNICAL

JOHN M. CHRISTMAN RAYMOND J. WALTER W. J. McKEEN

STRENGTH OF MATERIALS

By JOHN M. CHRISTMAN

THE section moduli of most common shapes are given in hand books. To take care of the unusual shapes the following method, which gives a very close approximation, can be used and does not involve any branches of higher mathematics. The materials used will have a greater variation than the error found when using the method. Another reason for a perfect answer being non-essential is that factors of safety of from two to twenty are used, depending on the nature of the work. This method is based on what was explained in the last issue of this magazine and may be easily reasoned out by referring to the latter.

The shapes considered must be the same above the center line as below and must be drawn 1 inch high. The full lines are spaced 1/10 inch apart, and a dotted line along which the measurements are taken runs between each of the full lines.

The dotted lines in Fig. 1 all measure 1 inch. (Your results from the magazine cut may vary due to the printer being unable to hold the cut to the correct size.)

At Fig. 5 the numbers .001, .009, .025, .049, and .081 are listed, and the length of the dotted line A, which is enclosed by the contour lines of whatever shape is to be considered, is multiplied by .081, B by .049, C by .025, D by .009, and E by .001. The products are added together to obtain the section modulus.

The section modulus of Fig. 1 is found as follows:

A × .081 = 1 × .081 = .081
B × .049 = 1 × .049 = .049
C × .025 = 1 × .025 = .025
D × .009 = 1 × .009 = .009
E × .009 = 1 × .001 = .001

.165

The correct answer by higher mathematics is .1666. The section modulus of the 1 inch diameter bar is as follows. (Note: It is not necessary to measure the dotted lines any closer than plus or minus .010 of an inch.)

A × .081 = .44 × .081 = .0356
B × .049 = .71 × .049 = .0347
C × .025 = .86 × .025 = .0217
D × .009 = .94 × .009 = .0082
E × .001 = .98 × .001 = .0009

.1008

The correct answer by higher mathematics is .098.

What is the section modulus of the oval shown at Fig. 3?
Ans.: Approximately .053.

What is the section modulus of the shape shown at Fig. 4?
Ans.: Approximately .038.

Using the method shown, what is the modulus of the section of a hexagon shaft one inch across the flats? The top is level.
Ans.: 12.

If the section modulus for a shape one inch high is known, the section modulus for any similar shape can be determined by knowing that the strength varies as the cube of the height.

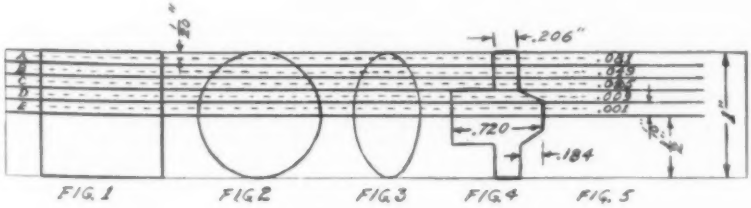
EXAMPLES

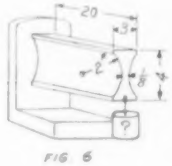
A 3" diameter shaft has a section modulus 3 x 3 x 3 or 27 times as great as a 1 inch diameter shaft.

A bar 2½ inches square has a section modulus 2½ x 2½ x 2½, or 15.625 times as great as a 1 inch square shaft.

Using a factor of safety of 3 and a tensile strength of 80,000 lbs. per square inch, what load will be safely supported in Fig. 6?

The solution of this problem will be in the next issue.





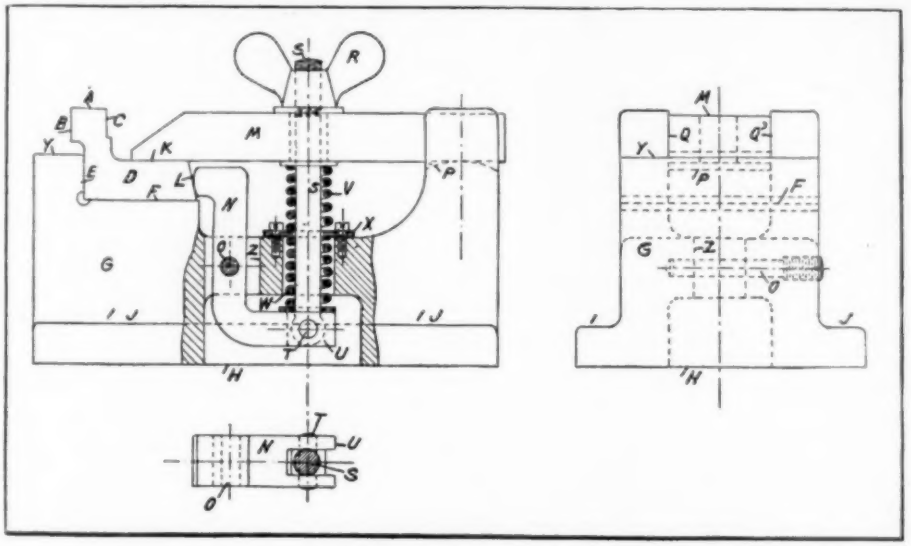
NEW TOOLS AND PROCESSES

B. L. DIAMOND HAROLD GILLER

WE are reproducing a cut from the French Magazine **Machin Moderne,** June 1933. The illustration was accompanied by a detailed description.

Briefly, the faces A, B, and C of the aluminum piece D are to be finished parallel and square with faces E and F and with each other. The part is located against faces E and F and clamped by M. and N.

M and N are operated by a screw S and thumb nut R, equalizing the pressure of the clamps. The clamps are drawn away from the work by retracting springs V and W, which work against a fixed plate X.



We believe the operation of the fixture is clearly shown in the cut, so we will omit further description.

This item is of particular interest because we are given a glimpse of what is being done in other parts of the world.

The article was clipped and submitted by our Secretary, Mr. A. M. Sargent.

We invite our members or readers in other countries to submit drawings of the tools which they are using in their lines of work.

TO OUR ADVERTISERS AND MANUFACTURERS

We would appreciate descriptions, cuts, and explanations of any new tools which you are about to put on the market. If you have something new call the A.S.T.E. Journal and a representative will call on you.

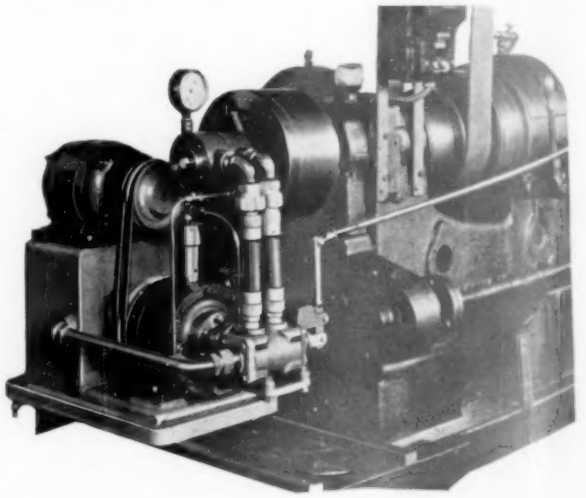
ELECTRIC HYDRAULIC CHUCK OPERATING UNIT

This equipment has been designed by The Tomkins-Johnson Company, Jackson, Michigan. It is built for use on machines which necessitate a single unit chuck operating mechanism. When installed, it becomes an outstanding efficiency increasing feature of that machine.

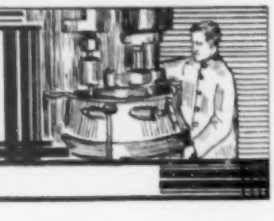
The unit is compact in construction, easily mounted on machine and capable of working pressures up to 250 pounds per square inch.

Oil from the tank is pumped to pressure required, through valve, into distributor and cylinder. To release chuck—operate the valve reversing flow into opposite end of cylinder, the exhaust oil returning to tank. A predetermined pressure level is maintained at all times. The motor, although running continuously, is not under load except for short intervals when the pressure, having dropped, is being returned to the desired level. By-passing of the oil has been eliminated, avoiding the heating of the oil to any appreciable degree.

The value of this unit installed on a machine which is isolated as far as chucking power is concerned, or on a machine which demands independent chucking power can readily be appreciated.



NEW MACHINES

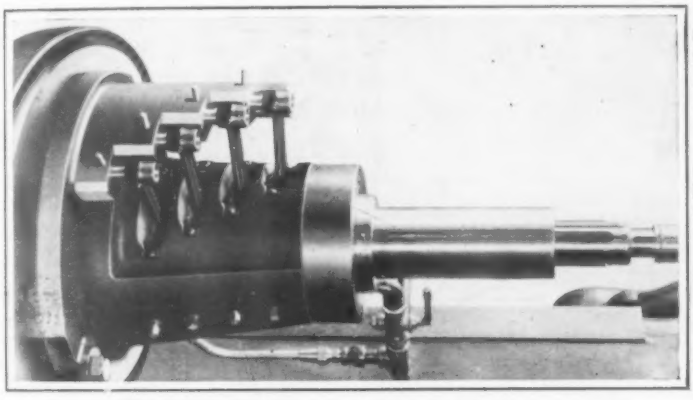


HAROLD GILLER B. L. DIAMOND

MICROMATIC DEVELOP NEW FIXTURE AND TOOL FOR HONING BORES

HERETOFORE it has only been possible to hone cylinder bores or tubes of such proportionate sizes wherein the length exceeds the diameter.

There has been a long-felt want for some internal machining process to produce greater accuracy and better finish on various size holes within a dimensional classification of rings or shallow open end holes. This field includes a large variety of parts made from many kinds of ferrous metals which are produced in sufficiently large quantities to warrant the initial expenditure for high production equipment. The most outstanding requirement has possibly been the



crank pin hole in connecting rods for small internal combustion engines and various roller bearing races.

The new type steel back replaceable bearing is now very extensively being considered for use in connecting rods for automobile, truck, bus and tractor engines. Inasmuch as the bearings necessarily have a very thin cross section, the accuracy, after installation, is only as good as the hole in the rod.

The automobile industry's necessity was the "mother" of invention, and the first practical application was installed by one of the largest motor car manufacturers for honing the connecting rods of their new V-type Eight Cylinder Engines. This particular requirement was necessitated by the use of a floating bearing. The internal surface of which turns on the crank shaft and the external surface in the connecting rod.

The new process not only gives accuracy far below limits heretofore possible to maintain it also introduces marked economies which cut costs by increasing the speed of production and, at the same time, eliminates the grinding operation on all parts except those made from hardened steel.

On the average heat treated steel or cast iron parts, it is not necessary to internal grind as it has been found practical to hone directly following any standard broaching, milling or reaming operation. Extensive production runs have indicated that the direct labor and material costs of internal grinding the crank pin hole of automobile connecting rods is only slightly higher than the combined costs of broaching and honing operations. However, the maintenance cost of grinding is considerably higher and the cost of initial equipment is over double. It is, therefore, essential to include the installation of the broaching or boring operations in the original machine tool set-up and consistently schedule the preceding operations in order to take full advantage of the accomplishment afforded by honing.

HONING PRINCIPLES MAINTAINED

While the features of construction and operation of the Micromatic Honing Tool and Fixture are radically new, all of the basic principles of honing are maintained. The general difference, in the case of this new development, is that the work is floated while the tool is piloted and, at the same time, a number of pieces are honed simultaneously.

FLOATING FEATURE FOR HOLDING WORK

The new Micromatic method allows each piece of work to float independent of the others so that there is no effect from accumulated error given by previous machining operations.

CENTERING AND ALIGNING

The pieces are centered and held in perfect alignment on resilient wiper guides which are mounted in the body of the honing tool, in such a manner as to obviate the necessity for clamping or locking.

COMPENSATING ABRASIVE STONES

The honing stones are floating in relation to the body of the tool and the work so as to compensate for any uneven stone wear and prevent the abrasive sticks from disturbing the alignment provided by the wiper guides.

ALIGNMENT MAINTAINED

The resilient guides extend beyond the abrasive members (as may be seen in the cut) so as to keep two or more connecting rods in alignment at one time. This feature positively assure the original alignment of the bore as produced on previous operations.

FULL AUTOMATIC OPERATION

The Micromatic Model 1A-Z-S Honing Tool used is fitted with a new standard small size, three finger, full automatic head which expands the abrasive members as the fingers enter the sizing and guiding bushing (shown at top of fixture in the cut) and likewise contracts the abrasive stones so as to collapse the tool as the fingers are extracted from the bushing on the final upward stroke. The standard Micromatic cone feed spring with cage regulates the initial pressure of the honing stones, provides constant free-cutting action throughout the operating cycle and limits the expansion to control diameter size.

DEGREE OF ACCOMPLISHMENT

For the purpose of making an exaggerated test to determine the limitations of this method, a selection of sixteen inferior diamond bored rods was made. This group included some pieces with errors of more than .0015" out of round, .001" taper and a maximum of .0017" difference in diameter size. After honing, another check was made with a very accurate Swedish Indicator Gauge which is calibrated in tenths of thousandths of an inch. The reading disclosed an accuracy well below .0003" for roundness and straightness and the difference in diameter size was reduced to within .0002." These results may be studied from reproduction of check sheets shown herewith.

(Continued on page 13)

OPERATION PLANNING

F. L. HOFFMAN

(Continued from June issue)

IN order to make the ideas of the tool engineer available for general use, they are recorded on operation sheets, known as masters.

The master operation sheet is usually a ruled sheet on which all information necessary to make the part is recorded in long hand writing by the engineer. The operation sheet for identification purposes contains the part number and the name of the part. The models used on, the material the part is made of, the assemblies that the part is used in, are recorded in the headings on the sheet. The portion of the sheet below the headings is called the body and is ruled vertically in columns, one for the departments which are to perform the work and the operation numbers, one for the operation, one for the machines and tools necessary to perform the operation, and one for the cost of tools and general information regarding the disposition of the equipment.

The first information written in the body of the sheet will be the size and length of stock required to make the part, whether it is a sheet metal part, forging, automatic screw machine part, bar stock or tubing, or anything made from stock having length.

The next information written in is the department which is to perform a particular operation and the operation number. This is usually the first column on the left. The second column is used for describing the operations in detail and is filed in the order in which they are to be performed.

Following the operation, in the third column will appear the machine and the number of machines repuired to turn out the necessary production. Following this are the tool numbers and notations for standard or commercial tools which are used.

The next column contains the name and description of the machine, tools, dies, gages and other equipment necessary to perform the operation . The last column may be used for general information for the engineer and others, the purpose of which is to check the procedure of the engineer and to show what disposition has been made of the various tools. For example, this column may state whether new tools were ordered or old tools altered to make the new part, or old tools adapted to take care of the old part as well as the new, ice, and so on.

or old tools are to be used for making the old part for serv-

The master operation sheet may be written on heavy paper, in which case another master is typed, known as the types master copy. The types master copy allows the making of numerous copies for distribution throughout the plant. Sometimes the pencil copy is written on strong thin paper which allows the making of blue prints, which in turn can be distributed.

The copies of the operations sheet are distributed to the tool designing department for use as a reference in the designing of the tools, jigs, fixtures, dies, gages, and other equipment. The designed uses the operation sheet to determine how the part should be located inn his fixture, what stage of finish the part has, and what finish is required after his particular operation. In order to design tools efficiently it is necessary that the operation sheet be followed and the engineer consulted before a departure is made from the prescribed plan. The engineer has exercised great care and thought in the planning of the operations and invariably knows how the tool should be designed to carry out the plan outlined. Many times a good plan of procedure has been ruined and the part found necessary to retool because of a lack of cooperation between the engineer and the designer.

Operation sheets are furnished the departmental layout group for arranging the machines, progressively where the part has a large production. It may be necessary to rearrange groups of machines, and add or remove machines, conveyors and other equipment. The time required to perform the various operations will have been estimated, which time will be used by the layout group to determine how the equipment should be arranged. The storage of rough stock at the head of the lineup must be considered as part of the layout as well as inspection and removal of finished parts to the assembly line. Space must be allowed for the workman and stock going to his operation as well as leaving it. Floor space and weight of machines are obtained from the equipment manufacturers' catalogs, which information must be followed in order to properly lay out a department and keep floor loads within the limits specified for that particular type of building.

(To be continued next issue)

JUNIOR ACTIVITIES

FLOYD CARLSON

Because there was no meeting in August, the Junior Activities Section has non to report in this issue of the Journal.

We have no new problems for this month's Journal. Evidently vacations and the heat (however, this has been a cool month of August) have been responsible for no new problems having been sent in.

A solution is still eagerly awaited for that problem that appeared in the June issue. Surely there must be some one in the Society capable of solving that problem. If not, we are disillusioned with the Seniors. Perhaps we must wait for some ambitious Junior to accomplish what the Seniors cannot do.

NEWS OF INDUSTRY

Control of Checker Cab Manufacturing Corporation, claimed to be the largest exclusive taxicab manufacturing company in the country, has been obtained by the Cord Corporation, L. B. Manning, Vice-President, announces. The company's main plant is in Kalamazoo, Michigan. More than 12,000 Checker built cabs are used in New York, Chicago, Pittsburgh, Cleveland and Minnepolis.

Reversing the trend shown in earlier reports, new car registrations in July for the first 20 states have shown a good increase over the same states in June. Earlier indications were that July sales would run between 6% and 10% under the June figures, but actually the registrations in the first 20 states show a gain of about 12% over the same states in June.

N. E. Wahlberg, Vice-President in charge of Engineering of the Nash Motor Company, announces the appointment of Mead F. Moore is Chief Engilneer of the company's Wisconsin plants. Mr. Moore served as assistant to Wahlberg when the plants first started in 1917.

The big open air show sponsored by the Chicago Automobile Trade Association opens with a bang. Brilliant night illumination will be provided by powerful flood lights. It is expected that hundreds of thousands of people will attend.

Export shipments of cars and trucks from General Motors plants in the United States and Canada are 196% greater than in July last year.

Studebaker sales in July continued to show substantial gains over 1932 according to Paul G. Hoffman. Sales of Studebaker and Rockne passenger cars in July increased 47.5% over sales in July, 1932.

Breaking all precedent for August sales, Plymouth Motor Corporation reports that retail sales by Plymouth dealers during the week ending August 5 totalled 7,413 units, a gain of almost 4 times sales in the same week last year. This was the highest week sales during the month of August in the history of the corporation and was within 112 cars an all-time high for week sales of Plymouth cars.

Official world records for sustained high speed have been shattered by Ab Jenkins, who sped around a course in the Great Salt Desert near Salduro, Utah, for a full day and night, part of the time in gales and rain, averaging 118 miles per hour throughout the total of 3,000 miles. The run was timed and sanctioned by the Contest Board Officials of the A.A.A. and jointly sponsored by the Pierce-Arrow Motor Car Company.

A.S.T.E. NEWS

LOLA CORBIN S. R. READ

Mr. D. W. Oviatt, formerly of the Buick Motor Car Company, Flint, Michigan, has recently accepted a position in the Staff Master Mechanic's office at the Dodge Plant.

Mr. Frank De Buigne has resigned as Machine Designer for the Ex-Cell-O Aircraft & Tool Corporation to accept the position of Assistant Chief Tool Engineer for the Chevrolet Gear and Axle plant.

The Secretary's Office is very pleased to announce that the Society was instrumental in placing Mr. John S. Bartek in a very satisfactory position. Mr. Bartek is now Engineer of the Modern Tool Division of the Consolidated Machine Tool Corporation, at Rochester, New York.

Mr. J. Wohlfeld, formerly with the Ford Motor Company, has accepted the position of Salvage Engineer with the American Iron and Metal Company, of this ciity.

Mr. Verne R. Drum, Operating Manager of the Jefferson Plant of the Chrysler Corporation for the past five years, recently resigned his position and has been succeeded by Mr. George Rumford of the Dodge Truck Plant.

We understand that Mr. Walter Cahill, formerly with the Ex-Cell-O Aircraft and Tool Corporation, is very happily situated with the National Automatic Tool Company, Richmond, Indiana.

Mr. Frank J. Morrisette, Master Mechanic at the Jefferson plant of the Chrysler Corporation, has been promoted to General Master Mechanic at the Dodge plant. Mr. Morisette is succeeded at the Jefferson plant by Mr. E. H. Devor, formerly Tool Room Superintendent at that plant.

It is with deep regret that we announce the death of Mr. Harry Bradley, on August 21st, 1933. Mr. Bradley was one of our Charter Members and was employed as an Operation Layout Man in the Tool Engineering Department at the Jefferson plant of the Chrysler Corporation for the past eight years. His presence, we are sure, will be missed by all with whom he came in contact .

THE IMPORTANCE OF TOOL ENGINEERING IN MODERN INDUSTRY

by C. M. MILLER

Associate Professor of Engineering, University of Wichita, Wichita, Kansas.

There is hardly an article or mechanism of any intricacy of design in general use today which has not been developed through the aid of the tool engeineers. For a commodity to be of general use, the price must be within reach of the consumer and this can be accomplished only by mass production. Large-scale production cuts down overhead and labor charges per commodity, and generally results in a much more refined and reliable product. Mass production would still be an impossibility were it not for tool engineering.

Tool engineering may be considered from two different angles: first, the design and manufacture of the large machine tools found in every modern machine shop and, second, the design and use of jigs, dies, fixtures, tools, gages, and other appliances necessary for mass production. Either kind of tool would be practically worthless without the other and the development of the machine tool should be considered briefly before discussing the importance of the accessory tool equipment.

Many of the basic machines were invented and developed in France and England. Due to the fact that machinist labor was poorly paid, the British employers did not realize so keenly the necessity for developing labor-saving machinery. Wage scales in the United States were at a higher level, and the American tool engineers were stimulated to improve machinery and methods. Brown and Sharpe and Pratt and Whitney were pioneers in the field for building refined and specialized machinery for production. The Brown and Sharpe Company was manufacturing high-grade sewing machines. Due to the fact that suitable machinery was not available, the company was obliged to design and build machine tools to meet the requirements of its own manufacturing department. They soon realized that other companies were waiting for these more refined machine tools, and went in for special tool manufacture.

When high-speed steel was discovered, a new field was opened for production. Old light machines had to be thrown out and new up-to-date machines took their places. Great improvements were made which cut down the time for setting and adjusting machines as well as increasing production through speed. Individual motor-driven machines with push-button control, special gear shifting devices, coolant pumps, lubrication pumps, and other accessories began to be used. Later, the single-purpose, semi-automatic, and automatic machines were developed. New grades of steels and alloys were developed which had a great deal to do toward tool machine improvement. Stamping, rolling, casting, forging, die casting, and welding machines were developed along with lathes, boring mills, grinding machines, planers, shapers, multiple-spindle drilling machines, radial drills, broaching machines, gear-cutting machines, punches, and others. Most of our modern machinery is highly specialized and has been developed by the tool engineer.

Considering the second angle of tool engineering, we may say that precision machining and interchangeable manufacture could not have been accomplished without the aid of jigs, fixtures, gages, and other inspection devices. Skilled mechanics are no longer required in the machine shop. Extra machining is not necessary upon assembling a machine. Running-in of assembled machines is seldom called for. Operations tending to fatigue the operator have been eliminated. Working conditions have been improved. All of these things tend toward low costs and greater production.

We may mention several examples where tool engineering has lowered costs through interchangeable manufacture. The old dollar 'Yankee' Ingersoll watch used to be produced at a total cost of twelve cents each. Not only was nearly every part made by automatic machinery, but the watch was assembled largely through the aid of mechanisms operated by the assemblers. If the watch were not running at the end of the assembly line, it was thrown out and destroyed. The material cost was so small that defective watches were not salvaged.

A certain adding machine with several hundred parts can be produced for about one-tenth its selling price by the use of stamped interchangeable parts which simplifies assembly and keeps the cost down.

Automobile manufacturing represents one of the best examples of superior tooling and inspection. Imagine the confusion which would result in the modern assembly line if parts were not interchangeable. Without special single-purpose machines, jigs, dies, fixtures, and gages, the cost of the modern automobile would be so excessive that few could afford to own one.

Many other appliances appear in nearly every home due to the low costs of production:—the radio, Victrola, telephone, typewriter, washing machine, clocks, refrigerators, and electrical appliances such as sweepers, stoves, flat irons, fans, and toasters. All of these owe their universal use to tool engineering and interchangeable manufacture.

With the automobile came the idea of service and repairs. Not many years ago some concerns paid less attention to interchangeability and depended upon the old method of "drill and ream at assembly." Upon making repairs, many tedious hours were spent in making replacements even by the skilled mechanic. Now, a part may be purchased and the repairs made in a short time without much fitting or adjustment of any kind. In fact, the old-time garage used to be a miniature machine shop, while now it is simply floor space with a bench for wrenches and tools.

The ability to provide service and repairs reasonably and in a short time has been the means of making many sales against competition. In some localities, the success of the sales force of a company has been due largely to the efficiency of its service and repair department. In fact, service and replacement has become the rule rather than the exception, and the life of many machines has been prolonged. And, of course, such efficiency could never have been accomplished without interchangeable manufacture and tool engineering.

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PRODUCTION RATES

(Continued from page 9)

Comprising the use of fixtures to hold four pieces to be honed simultaneously, time studies were made under average production conditions. This revealed that .0007" to .0012" stock may be removed from a broached hole in an actual honing period of twenty-five seconds with a floor to floor time or forty seconds, while upwards of 300 rods are honed with one set of stones.

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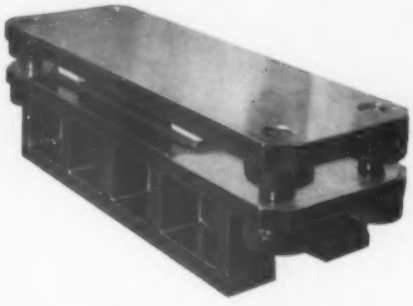

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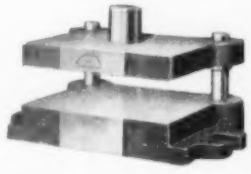

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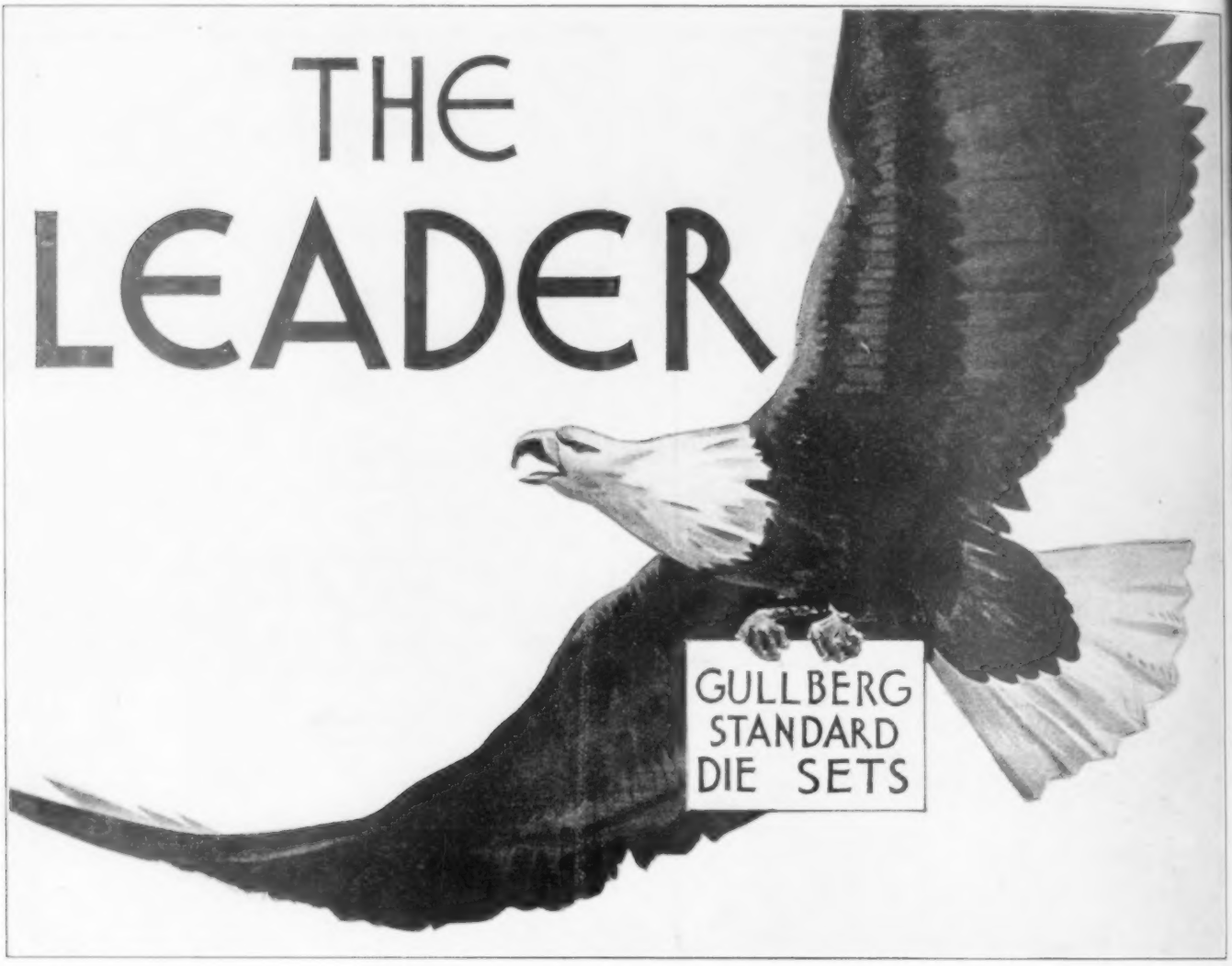

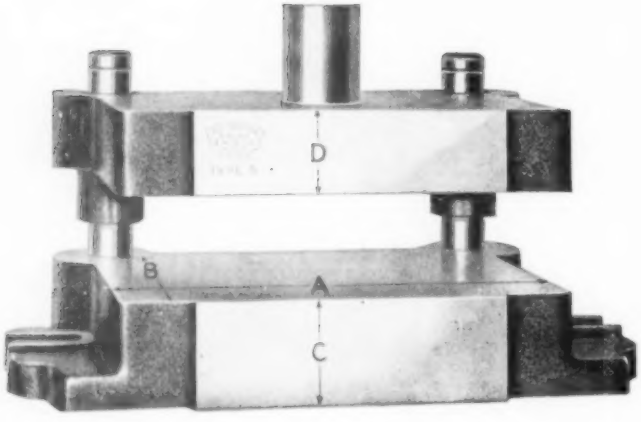

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